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New York

CONFERENCE ON INDUSTRIAL HYGIENE

THE ROCKEFELLER FOUNDATION

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CONFERENCE ON INDUSTRIAL HYGIENE

Held at the Yale Club in New York City, November 14, 1919,

Upon Invitation of the Officers of the Rockefeller Foundation*

THE FIELD

The following facts bearing upon the field of industrial hygiene, which at once suggest the occasion for and the setting of this conference, were outlined in memoranda submitted by persons invited to the conference and were presented as the basis and the guide for the discussion:

1. There are at present in the United States over 900 corporations which employ more than 1,500 industrial physicians, most of whom are said to be on a full-time basis. The DuPont-Nemours Company is reported to employ more than 50 physicians, the International Harvester Company 40, and the Goodrich Rubber Company, of Akron, Ohio, more than 20. Among the other corporations that have adopted medical systems that have attracted attention are the following: United States Steel Company; Tennessee Coal and Iron Company; American Telephone and Telegraph Company; The Norton Company, of Worcester, Massachusetts.
2. The Association of Industrial Physicians and Surgeons meets annually and is reported to have a membership of over 100.
3. Existing and pending health insurance legislation is a problem in industrial hygiene.
4. Research in industrial fatigue seems necessary to a solution of many fundamental problems of industry.

Government Agencies

5. Government, state, and municipal agencies are meeting various phases of the industrial hygiene needs:

The United States Public Health Service has appointed a corps of industrial physicians to make studies in manufacturing plants in various parts of the country.

*NOTE: The officers of the Rockefeller Foundation felt that such a conference would suggest and clarify many problems in connection with this important topic in the general field of public health. It has not appeared feasible for the Foundation to undertake definite programs in industrial hygiene.

The Pennsylvania State Department of Labor and Industry has a Division of Industrial Hygiene and Engineering.

The New York City Health Department has appointed a number of industrial physicians and is developing various phases of the field.

In Newark there is a municipal clinic for industrial diseases.

At Perth Amboy there is a similar clinic conducted by the United States Public Health Service.

No doubt there are many other similar agencies in various parts of the United States.

Existing Training Facilities

6. Lectures or courses in industrial hygiene and occupational diseases are given at the following institutions: Cincinnati Medical College; Harvard-Massachusetts Institute of Technology; Johns Hopkins School of Hygiene and Public Health; Museum of Safety, New York City (course of lectures on "Safety Fundamentals"); Rush Medical College; State University of Ohio; University of Pennsylvania; Yale University.
7. There is thus far in this country no institution which has the combination of an Industrial Hygiene School with a hospital for the highly specialized care required for industrial injuries and occupational diseases, in which facilities are available for training and research.



TOPICS SUGGESTED

1. Is there need for additional teaching facilities in industrial hygiene?
 - a. How many industries employ physicians?
 - b. How many employ full-time physicians; how many employ part-time physicians?
 - c. How many highly trained men can the field absorb?
2. Teaching of industrial hygiene.
 - a. What are the existing facilities for training industrial physicians?
 - b. Can industrial hygiene be adequately taught as a department of a public health school?
 - c. Is a separate institute necessary?
 - d. What courses should be given?
 - e. Should medical and surgical relief peculiar to industrial conditions be taught in a separate hospital? Should such a hospital be a part of a school?
 - f. Should there be a hospital and dispensary for the treatment of occupational diseases and injuries?
3. What should be the objective?
 - a. Should the course of training be sufficiently complete to lead to a degree?
 - b. Should there be short intensive courses for those already employed as industrial hygiene doctors?
 - c. Should there be a research department?
 - d. Should the field of the safety engineer be covered in the curriculum?
 - e. Should there be special training provided for industrial nurses? For laymen to fill positions corresponding to hospital steward and sanitary inspector?
 - f. Should field investigations and special studies in industrial plants be provided?
 - g. Should there be provision for public education in industrial hygiene through lectures, literature, demonstrations, visiting nurses, etc.?
 - h. Should effort be made to standardize the medical equipment, quarters, facilities, etc., in industrial plants?
 - i. What provision should be made to meet the requirements of health insurance legislation?
 - j. Should steps be taken to standardize the sanitary construction of factory buildings and appurtenances?
 - k. Should publications be issued embodying the results of special pieces of research, standards of industrial hygiene, etc.?
4. How should the teaching of industrial hygiene be organized? What departments should it embrace?
5. To insure attendance will it be necessary to provide scholarships and fellowships?

PERSONNEL OF THE CONFERENCE

Prof. Charles Baskerville,
College of the City of New York,
American Chemical Society.

Dr. Hermann M. Biggs,
New York State Dept. of Health.

Dr. W. Irving Clark, Jr.,
Norton Company, Worcester, Mass.

Dr. Cecil K. Drinker,
Dept. of Industrial Hygiene,
Harvard-Mass. Inst. of Tech.

Dr. David L. Edsall,
Harvard Medical School,
Dept. of Industrial Hygiene,
Harvard-Mass. Inst. of Tech.

Dr. William A. Howe,
(Representing Dr. John H. Finley)
Board of Regents, State of N.Y.

Dr. Simon Flexner,
Rockefeller Institute for Medical
Research.

Dr. C. E. Ford,
General Chemical Company.

Dr. Otto P. Geier,
Cincinnati Milling Company.

Dr. Emery R. Hayhurst,
Division of Industrial Hygiene,
Ohio State Dept. of Health.

Dr. Frederic S. Leo,
Physiologist, Columbia University.

Dr. Thomas M. Legge,
Medical Inspector of Factories,
London, England.

Dr. T. Mitchell Prudden,
Rockefeller Institute for Medical
Research.

Dr. J. W. Schereschewsky,
Assistant Surgeon General,
U.S. Public Health Service,
In charge of Industrial Hygiene.

Dr. Renold A. Spaeth,
School of Hygiene and Public Health
Johns Hopkins University.

Dr. W. Gilman Thompson,
Clinic for Functional Re-education,
New York, N. Y.

Mr. C-E. A. Winslow,
Professor of Public Health,
Yale University.

And the following from the Rockefeller
Foundation:

Mr. George E. Vincent,
President of the Rockefeller Foundation.

Mr. John D. Rockefeller, Jr.,
Chairman of Board of Trustees of the
Rockefeller Foundation.

Mr. Wickliffe Rose,
Director of the International Health
Board of the Rockefeller Foundation.

Dr. Victor G. Heiser,
Director for the East,
International Health Board of the
Rockefeller Foundation.

Mr. Edwin R. Embree,
Secretary of the Rockefeller Foundation.

Mr. Charles Cason,
The Rockefeller Foundation.



SUMMARY OF THE CONFERENCE

Mr. George E. Vincent, Presiding:

From several different sources requests have been made to the Rockefeller Foundation to cooperate in different phases of industrial hygiene. This subject falls within the field of public health to which the Foundation is giving special attention. In view of the fact that industrial hygiene or medicine is a new and rapidly developing department of public health work, it has seemed desirable to the officers of the Foundation to call this conference of men recognized as leaders in this movement. I desire to express appreciation of your acceptance of our invitation.

By way of opening the subject I propose to call upon a group of men who are familiar with the practical aspects of industrial hygiene and then upon several representatives of the special training which is being provided for workers in this field. A syllabus or outline has been prepared as a basis for discussion. This incorporates the suggestions which have been solicited in advance from those who were invited to attend this meeting.

Dr. J. W. Schereschewsky:

It is a matter of great pleasure to me to be able to be present at this meeting, because it is an earnest of the very great interest which this problem is presenting to those who are studying the needs of the country, and it marks a stepping stone in the progress which I trust we will see in the next few years. To those who have looked into this matter of industrial hygiene, it is evident there is urgent need for very great improvement in the situation.

There are some 45,000,000 occupied persons in the United States, of which 25,000,000 may be classified as industrial workers. There is enormous economic loss because of preventable illness. We are faced at this time with the necessity for prevention. The war has taught us the great value of man power to the nation, but a large amount of man power is wasted because of ill health which is preventable. If we are to improve industrial conditions we must direct attention to industrial health.

One of the best means for promoting industrial health is the establishment of what may be best called industrial health service. One of the best things industry can do for itself is the maintenance of a continuous state of health in workers. The ability to supply health service is a most fascinating problem, for the reason that nowhere else do we have a group of people so ready at hand to influence toward better health than exist in industry. We must ascribe a certain portion of the present condition of industrial unrest to ill health. When we consider this problem it is one of ex-



Dr. Schereschewsky - Cont'd:

treme complexity because it requires the co-ordinated efforts of interlocking agencies, such as educational forces, the national government, the state governments, the general public. The industrial worker, too, is himself responsible to a certain extent for improving his own health.

The Public Health Service in its study of this question has brought out a program for the general improvement of national health in which improvement in industrial health plays an important part. The object of this program is to outline what the federal government may do to stimulate such improvement. The federal governmental powers are advisory, investigative and co-operative. The states are to be regarded as the agencies which will place into operation the police powers of the people to aid in framing regulations and in insuring uniform conditions throughout the country. The part that educational institutions may play is to furnish the necessary personnel to carry out such a program. The most important thing in the development of a program of industrial hygiene is necessarily the personnel which puts it into effect. We have in Industrial Health Service a means whereby capital and labor may meet on a common ground. It becomes a means of revealing the identity of their interests. It is susceptible of forming one of the most potent agencies which we can devise for welding society into a harmonious whole.

We are now ready as a nation to go very deeply into the general promotion of public health. It is therefore necessary to develop at the earliest possible moment a national program for the



Dr. Schereschewsky - Cont'd:

improvement of industrial health in which all shall play a co-ordinate part. When this is done that will be the basis for educational facilities in order to carry out the program which has been mapped out. The program so far as the federal government is concerned is a large extending of the service, much larger than has been in the past, and to extend it to cover the whole country. There are required to be made minimum standards of industrial health; there should be means provided for the reporting of industrial morbidity and mortality statistics; steps should be taken to improve the sanitation of industrial communities. The federal government, therefore, should furnish the leadership and should co-operate with the states in performing these general duties which I have outlined. So far as the state is concerned it should provide the necessary machinery and organization to really enforce proper regulations for community and factory sanitation.

In the organization of inspectors of factories this country differs greatly from foreign countries. The requirements of factory inspectors abroad is very much higher. So far as industry is concerned, it owes it to the workers to provide decent working conditions. The worker should make use of all facilities which have been provided for the improvement of his health.

Dr. Thomas M. Legge:

Mr. Chairman, Dr. Schereschewsky has pointed out and voiced the feelings of us all as to the importance of this gathering. As I have had unique opportunities in Great Britain of studying industrial conditions and their effect on the workers themselves, I would like to give you the results, in part at least, of my experience.

I have held the position of medical inspector of factories for 21 years, and for 12 years of that time I worked single-handed. Since then I have had a colleague, and just before I left for America a third colleague was appointed. But all this time I have been in touch with the Certifying Factory Surgeons appointed throughout the country by the Chief Inspector of Factories. Otherwise my task would have been impossible. The most useful thing I can do perhaps is to go rapidly through the agenda and give you my views on the several items as they might apply in Great Britain.

We have not, as you have in America, a very large number of full time physicians. Indeed until the war I do not suppose there were more than a dozen large firms in Great Britain employing a full time physician. During the war, however, nearly all the plants employing more than 2,000 workers would have one, two, or three full time medical men or women.

There is no question whatever as to the need of additional teaching facilities. My own feeling is that there should be no water tight departments in regard to training and teaching in industrial medicine. It is a matter of general medicine and surgery. The more you can bring that knowledge to bear in the training of the medical

student so much the better. There must be specialists, but they also should be closely associated with the medical schools. It would be a mistake, in my opinion, to set up an independent institute for the training of industrial physicians and surgeons.

In Great Britain the facilities for teaching industrial hygiene are extremely limited. I should think there are fewer facilities there than in America. Only one university has taken up the subject at all, that is the University of Manchester. In Great Britain, in addition to the general medical course, we make it a necessity that in a town with 50,000 inhabitants or more the medical officer of health must hold a special diploma in public health for which attendance at a postgraduate course lasting six months is necessary and is supposed to include a knowledge of occupational diseases. In addition to the teaching, the post graduate who enters on this course must spend six months with a medical officer of health. This six months is largely a waste of time; they do not need so long a time. The General Medical Council made it possible for universities giving this course to limit the amount of time spent with a medical officer of health to three months provided that during the other three months additional instruction were given, and at Manchester University they elected to give courses in factory and school hygiene and veterinary hygiene. About 1908 I was asked to lecture on factory hygiene. That I have done since then except for three years during the war. I only give six lectures during the summer. That is a very meagre amount of teaching. However, all lectures are of two kinds:



first, those that actually teach, and secondly, those that are intended to stimulate interest, and all I can do is to give lectures which try to stimulate. These lectures cover briefly:

1. The statutory duties of the medical practitioner in regard to industrial diseases and their duties in regard to the workman's compensation act.
2. General hygiene of the factory.
3. Special hygiene of the factory.
4. Industrial fatigue.
5. A description more particularly of the notifiable diseases.
6. Other diseases scheduled under the workman's compensation act.

I certainly believe that industrial hygiene can be taught adequately as a department of a Public Health course provided that the public health school is associated with a general hospital and that the clinical side of medicine is never left out of sight. Anything that divorces a medical man from the practice of medicine is to me a most deplorable thing. I hope that industrial hygiene will not fall into the hands of the public health service which is concerned solely with administrative matters and is not directly connected with clinical practice.

On the question of whether medical and surgical relief peculiar to industrial conditions should be taught in a separate hospital, I am decidedly of the opinion that it is better not to teach it in a separate hospital, but that all facilities should be centered in a general hospital where special emphasis can be given to occupational diseases.

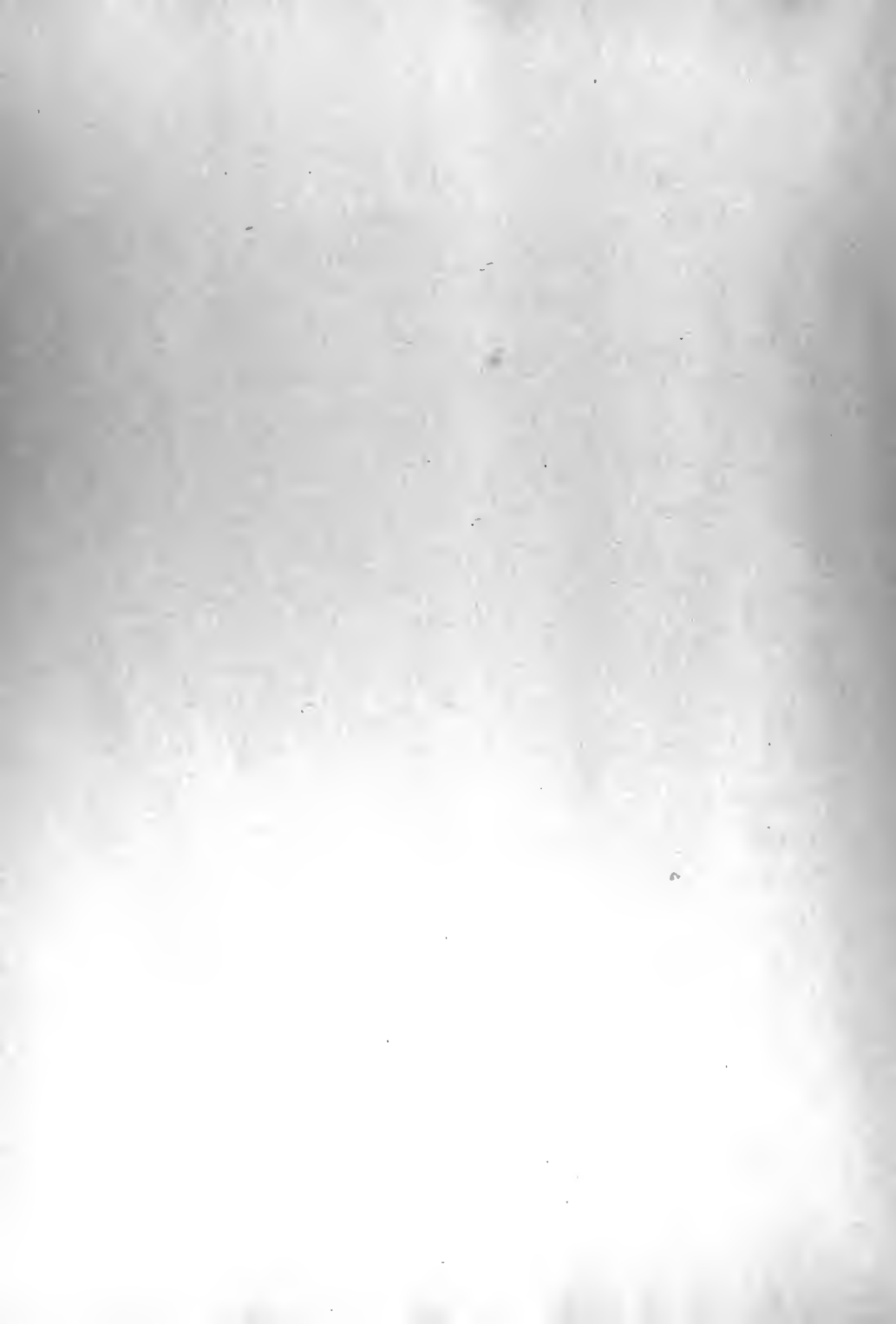
Should there be a hospital and dispensary for the treatment of occupational diseases and injuries? There again I take the same



view. No, but naturally special importance would be given to them in dispensaries in districts where occupational diseases are most likely to be met with.

Should the course of training be sufficiently complete to lead to a degree? I should strongly oppose this. I am not in favor of a degree being specially given in industrial medicine. I should be quite willing for a certificate to be given, but I should not like to see an M.D. granted in industrial hygiene alone.

I quite agree that there should be short, intensified, courses to bring industrial surgeons together and advance their knowledge, and a research department would be one of the things I should regard as essential. Practically all the teaching of industrial hygiene can be centered around a research department. As an example of the utility of research I may say that we failed appreciably to check anthrax before and during the period of the war. We have reduced its mortality because we have better methods of treatment,--the product of research--but we had not given as much thought and research to the cause as to the effects of the disease. A committee appointed by the British Government carried out some very searching experiments during the war with a view to discovering if possible a means of destroying anthrax spores in wool - the principal industry affected. After some 130 experiments this Committee definitely proved that anthrax spores in wool could be destroyed by a method they devised without damaging the material for manufacturing purposes. The British Government is a practical one when it is given a direct lead, so we



are now arranging to erect a trial disinfecting station in Liverpool to disinfect wool with the result that Bradford and other wool districts will be freed from the menace of this disease.

Again, in another instance, it was found that when the wet bulb thermometer, where artificial humidity was introduced into a cotton mill, rose beyond 75° Fahrenheit the body temperatures of the weavers themselves began to rise to 100° or 101°, and this was the cause of their complaint and objection to working under such conditions. We now have a law that no artificial humidity shall be introduced when the wet bulb thermometer rises above 75° F. I am perfectly certain that any research department should be in close touch with manufacturing plants.

I do not think the field of the industrial physician or surgeon should cover that of the safety engineer except in a very general way. After all, the doctor cannot be expected to know everything. It is well for him to go round the factory and make suggestions as to whether the ventilation, heating, and lighting are, in his opinion, good or bad, but he may blunder badly in trying to say how the remedy should be applied. That is what the factory inspector should be trained to do. In Great Britain our factory inspectors are drawn largely from the class of engineers. Those who enter quite early in life prove the best. We have chemists who are also valuable. In Prussia there were no medical inspectors of factories up to the time of the war. Although they had no doctors especially associated with factory inspection, and Great Britain had a great many, we had



never produced a book on the subject. However, Germany with no factory surgeons has produced a book called, "The Factory Surgeon".

Should there be special training provided for industrial nurses. I think there should be.

Should field investigations and special studies in industrial plants be provided? This must, of course, be a sine qua non.

Should there be provision for public education in industrial hygiene through lectures, literature, demonstrations, visiting nurses, etc. This should be provided.

Should effort be made to standardize the medical equipment, quarters, facilities, etc. in industrial plants? There should be efforts made to standardize medical equipment. We have a standard equipment for first aid and ambulance provision in Great Britain and in the course of a year or two we shall make our requirements applicable to practically all industries. Briefly it is this: In every engineering shop there must be provided for every 140 persons a first aid box. In that box there must be three dozen sterilized finger dressings, one dozen sterilized dressings for the hand or foot and one dozen sterilized dressings for other parts of the body. There must be tincture of iodine, sterilized cotton wool and eye drops containing 0.5% cocaine in castor oil. Where there are more than 500 persons, in addition to this first aid box there must be an ambulance room, because our feeling is that a workman will not take the trouble to walk 200 yards to be treated. Where there is a good ambulance room sometimes objection is raised to the use of the first aid



box in addition. Where there is a doctor in the factory, or one visiting there every day, we suppress all these requirements.

What steps should be taken to standardize the sanitary construction of factory buildings and appurtenances? I am opposed to the standardizing of the construction of factory buildings. Some parts of the building can be standardized, but whatever you do, leave the actual construction of the factory buildings to develop as the architect may have a mind to.

Should publications be issued embodying the results of special pieces of research, standards of industrial hygiene, etc? Naturally there should be publications embodying the results of research.

I give you what in my opinion should be the function of the factory physician:

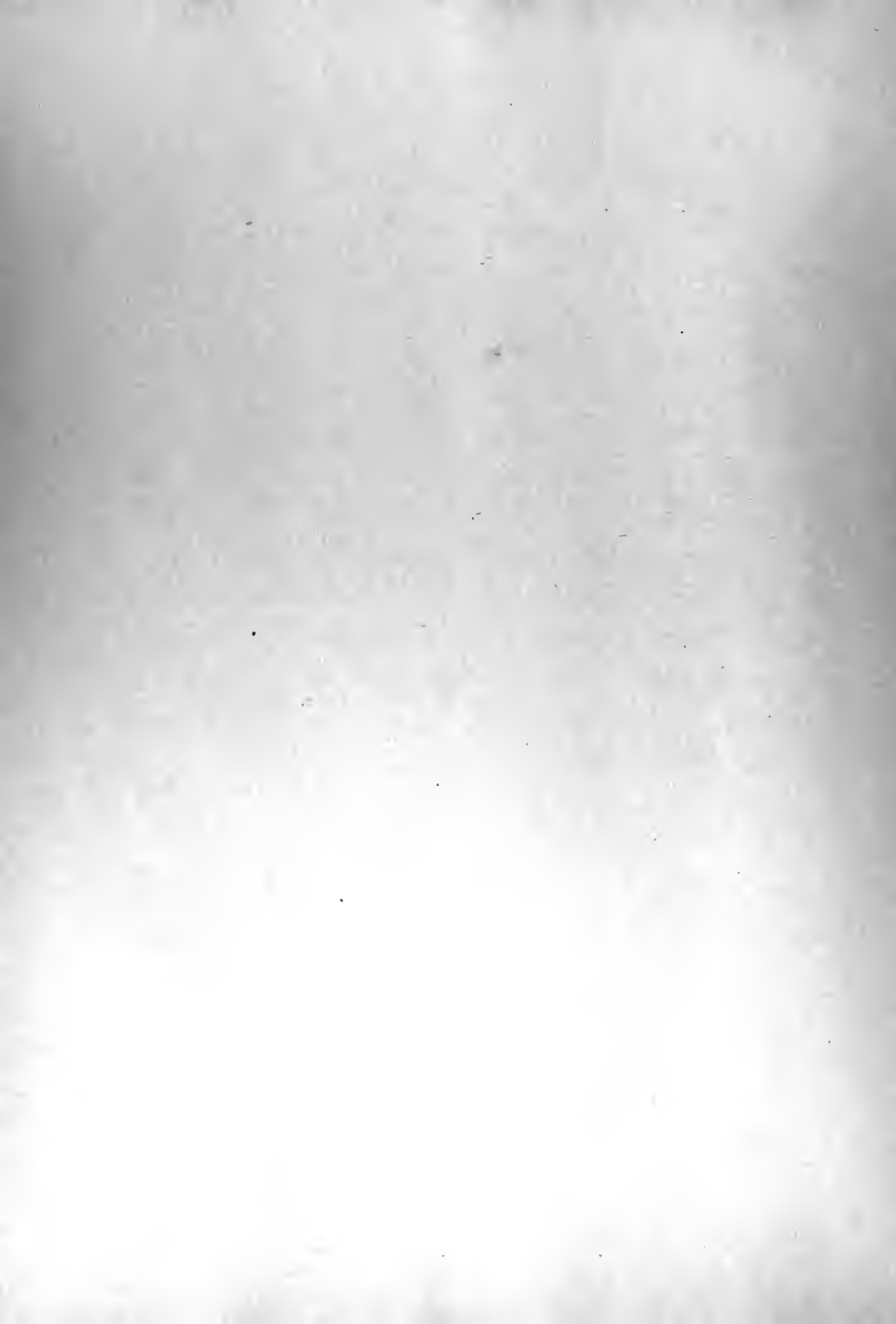
1. Initial detailed medical examination of all applicants for work, attaching, where necessary, conditional certificates, either on personal grounds, or as to the nature of the work on which he or she is to be employed.
2. Re-examination of such persons as he considers need it, and power of inquiry to see if previous conditional certificates have been observed.
3. Periodic medical examination, under regulations and special rules, of workers in special dangerous processes.
4. Periodic medical examination of those who have suffered from tuberculosis and of all others (e.g. those with heart disease, disabled soldiers, etc.) affected with illness which, if not watched, might prove incapacitating, with power to specify the nature of the work upon which they may be employed.
5. Examination of cases referred by the welfare supervisor and especially to advise in such matters as outbreaks of occupational dermatitis and the like, for which treatment could be prescribed.
6. Supervision of the first aid and ambulance equipment and of its use.

I hope that in Great Britain before long we shall have part-time state medical officers. They must be linked up with some clinic where they can have the assistance of experts, one of whom might very well have studied particularly industrial hygiene. I am thoroughly opposed to a state medical service as interfering with initiative and reducing the level of efficiency, but I am just as strongly in favor of a part-time state medical service.

Dr. W. Irving Clark, Jr.

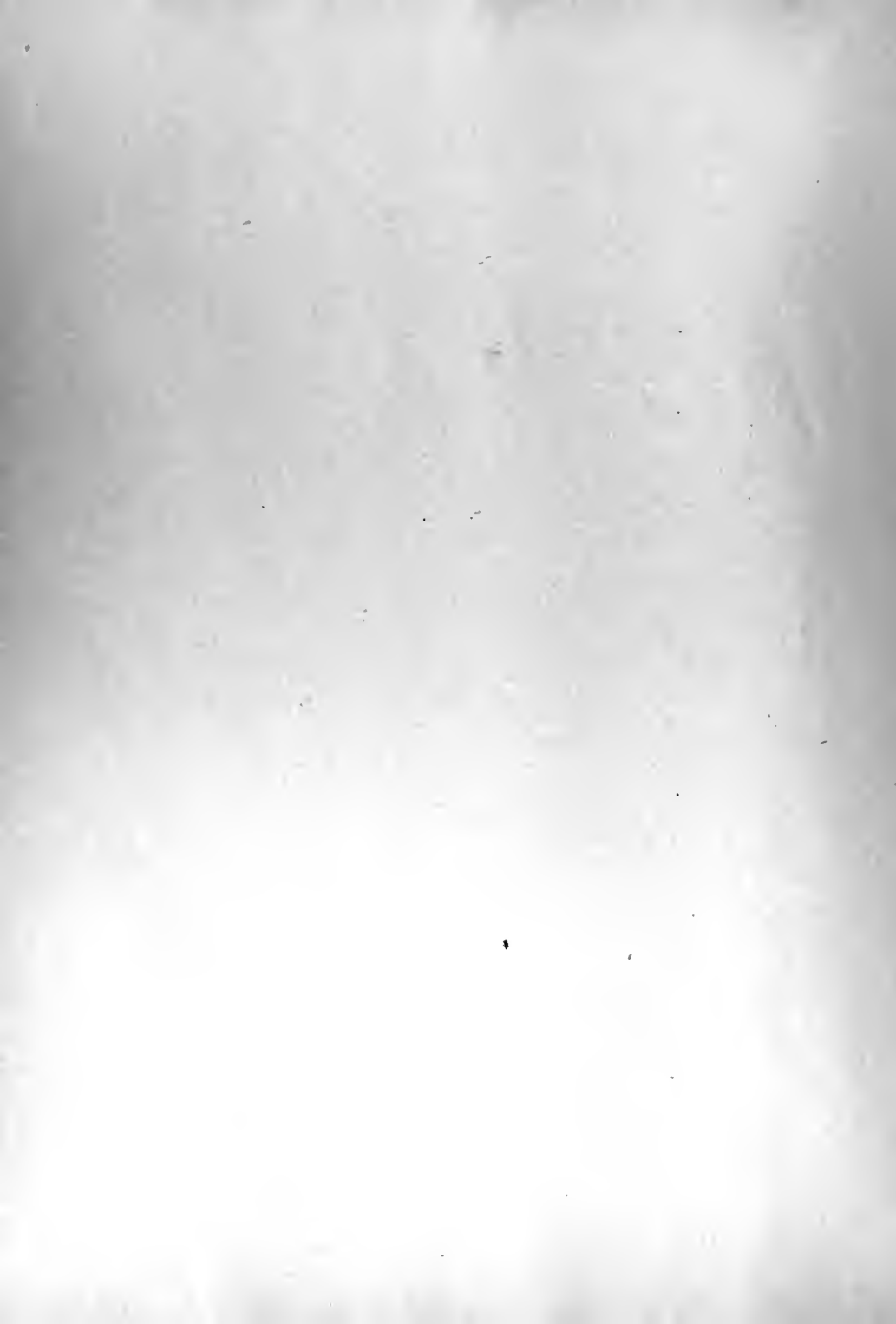
I have been particularly interested in what Dr. Legge has had to say, because it so absolutely coincides with my own mental answers to these questions. He has come to the same conclusions that I have, and I think I represent the men who are doing this work. I believe if people working along the same lines without the knowledge of what others have been doing reach the same conclusions, that those conclusions must be pretty accurate.

There are two distinct points of view to be taken, two parties who are interested. In the first place, the practical man who is doing industrial medicine; in the second place, the man who is interested in research and in the development of further ideas in the study of conditions of the men who are being taken care of by medical supervision. My experience is that the factory is willing and able to provide funds to give the hospital facilities, but are not able or willing to provide for the research side of the work. That is, to my mind, a thing which is needed very much, because I believe that there is the opening wedge in that idea. If we can once get industry as a whole to appreciate the possibilities and advantages to the country and their own industry of research work along these lines it seems to me the financial backing will be tremendous. Manufacturers as I see them are interested definitely in the medical supervision of their employees. When I began my work eight years ago there were few companies who were carrying out this work, but it has greatly increased until now there is hardly a very large corporation which is not carrying on work in industrial hygiene.



As far as research work goes, there is no definite coordination between the teaching in medical schools and the actual work in factories. I think this is coming. As far as the actual work goes, the type of man who is doing it I believe should be of the very highest. He should be well trained and should have taken some intensive work in industrial hygiene. This is necessary because the average man does not get that type of training in the medical school or in the hospital. I hope to see the very best men we have in the country doing industrial hygiene.

I believe in part time work because I believe it is the greatest advantage to the industrial man to keep in touch with scientific medicine all the time. He should be engaged in practice, not necessarily private, but with a hospital. The combination of hospital with industrial practice can produce more efficient work than any other combination along health lines that I know of.



Dr. C.E. Ford:

I think I agree in the main with what has been said. I perhaps disagree with Dr. Clark in his comment with regard to part-time men. I thoroughly believe that in all medico-social service whole-time men are preferable to part-time men because the latter are sure to let their selfish interest interfere with their work.

The great problem I am having is in securing medical men with a social conscience. I had hoped that with the close of the war men would be available. I was in hopes that the experience of men in army service would teach men to work with groups, to work with an organization. Some 30 or 40 names were filed in my office during the year. Expecting this fall to reorganize my staff, I selected the best ten of that group and corresponded with them. I asked them to give their special reasons for wanting to enter industrial work. That particular question was never answered. I had only one application for the job. He demanded a salary of \$10,000 a year. I will concede that a good industrial surgeon is worth that sum to any industrial organization, because I think the industrial surgeon can make himself just as valuable to the industry as the superintendent himself. We must have men in industrial medicine who have had, by reason of wide medical experience, the peculiar requirements incident to industry and contact with the public, or men who have been specially trained by the universities. As yet there has not been developed the facilities for so doing.

I think there should be devised some manner for conducting research into the question of industrial medicine.

Dr. Otto P. Geier:

This meeting can really be an epoch making one, depending upon whether this conference takes a sufficiently wide view of the problem we are discussing. If we take the broadest view, then this meeting may make a real contribution to world-wide industrial problems which are before us today.

In other words, are we talking today of the subject of industrial hygiene or are we talking to the point of industrial medicine in its broadest aspect? The latter term is far more inclusive. Some of you may take exception to that statement, but as industrial surgeons meet today, men who are on the firing line giving their whole thought, souls and bodies to this subject for the sake of the industries and for the sake of the men, they include something far greater in the term "industrial medicine" than industrial hygiene means to the profession at large.

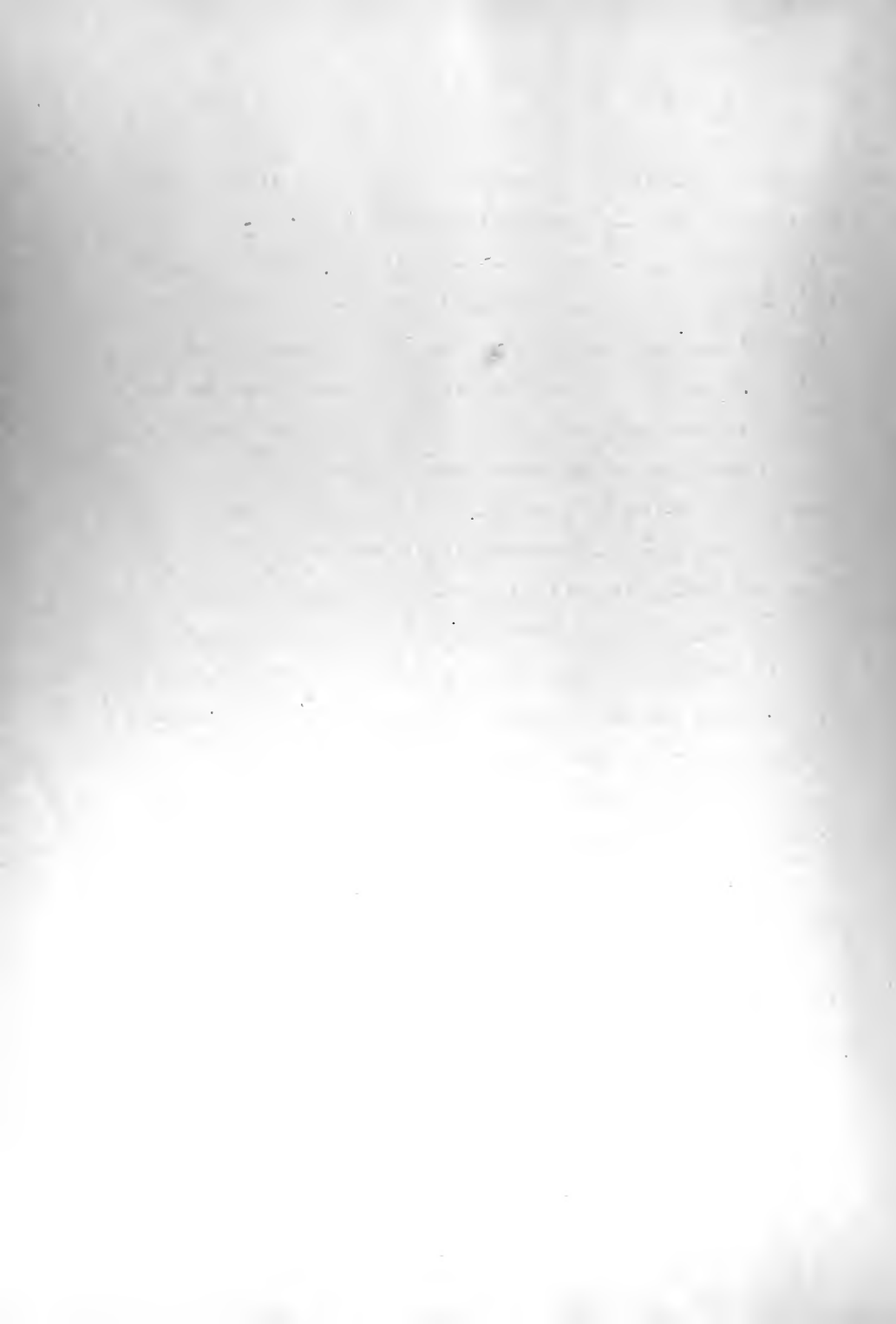
As I view it, this group today is discussing what possible contribution industrial medicine may make towards a broader and more democratic application of the science of medicine to the people at large. Dr. Vincent at the table today mentioned the diagram which I placed before another meeting here yesterday. This diagram emphasized the necessity of realizing that the practice of medicine is threatened with certain organic changes. In the first diagram an attempt was made to portray the outstanding features of medical practice as they obtain today. It purposes to show how inaccessible to the average practi-

tioner and to the average patient are the best diagnostic facilities and treatment that the profession affords. These facilities, provided at public expense, should not be accessible to the rich and the poor only. Furthermore, the Chinese wall between the leading physicians, the hospital group and teachers, and the profession at large must be removed. Efforts must be made to democratize knowledge for the benefit of better medical service to the great producing masses of the people. The present scheme makes higher standards and adequate medical service difficult.

The keynote of the second diagram was the group diagnostic clinic just in the infancy of its development in this country. A system of early diagnosis, prevention, and cure must be devised to lower the sickness rate and increase production. To accomplish this we must depart from our intensely individualistic method of the practice of medicine. The industrial clinic is the forerunner of some such type of development of medicine, looking to the better care of the worker. The industrial clinic acts as a diagnostic clearing station for the producer and puts him directly in touch with the best in medicine.

We have progressed about as far as we are likely to progress in the matter of public health supervision. The public is saturated with the material it gets from the press. We must find some way of intensively applying our knowledge of preventive medicine. If we can tie up a man's work with his health program, he will accept it.

If we stopped all research today and did nothing but apply



the already known facts for the next ten years, the general level of the well-being of the world would be higher than if we put so much energy into research. That is a rather drastic method of bringing that thought to you. I cannot help but feel that medical men are stressing too much the need for further extended research, and are not placing before these foundations the tremendous necessity of securing the more general application of that which we already know.

Dr. Legge's discussion has been very illuminating, and I agree with most that he has said. My disagreement is with the position the industrial physician should hold. If we are to make this thing work, we must stop thinking in terms of the big factory and think in the terms of the factory of 200, 300, or 400 employees.

When we are doing the thing we are talking about today, we open the first way toward a real enlargement of medical and health facilities in this country. Capital must pay for the increased health facilities that are to be brought about. We know that it is difficult to get enlarged health budgets. On the other hand, when industry spends \$8 to \$10 per person on its health work, it gets an enlarged appreciation of public health, and is prepared to have larger funds spent in that direction.

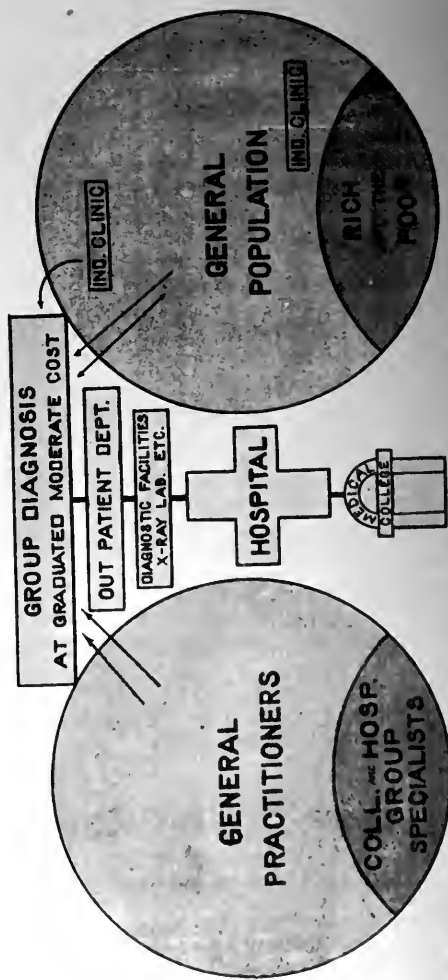
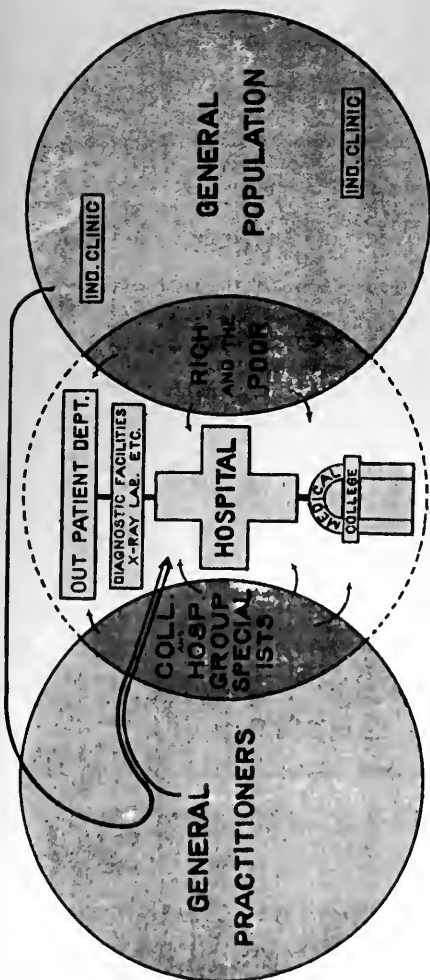
Dr. Legge:

Have you in America anything similar to our panel system of practice in Great Britain, where each individual worker chooses his own doctor?

Dr. Geier:

The only parallel that we have in that direction is the Workmen's Compensation Acts, whereby workmen are compensated for loss on account of injuries received in the factories. Possibly \$100,000,000 are being spent in this country annually for the care of injured workmen. In Ohio we are expending some \$12,000,000 annually, of which \$3,000,000 at least are being wasted because industrial medicine has not yet sufficiently been advanced in our state.





Dr. Frederic S. Lee:

We have been speaking of ways and means of promoting industrial hygiene, of conserving the health of the industrial worker, but what is our ultimate object in doing this? The ultimate object, it seems to me, is the securing of maximum production without impairing working power. With this object in view, we wish to discover and to establish the conditions under which it can be achieved, under which the worker can do his best. There is one phase of this general subject, a phase that is covered by the term "industrial physiology", about which little is known because it is very new, but it occupies, I believe, a position of foremost importance, and with your permission, Mr. Chairman, I propose to speak briefly of it.

"Industrial Physiology" is one of the products of the war. Certain premonitory symptoms of its coming had, however, appeared before the war began. In 1913-14 some of the leading physiologists of France formed a plan for a considerable study of the conditions of work of the human mechanism in the factory. Their intention was to interest their own and other governments and undertake an extensive international investigation. The coming of the war, however, put a stop to their designs. But the war, curiously enough, afforded in other countries the very stimulus that was needed for the inauguration of similar plans- and the result has been that very considerable progress has been made. The first move was made by the British Health of Munition Workers Committee, which existed from 1915 to 1918. The Committee issued some twenty-four publications on a variety of topics, the papers presenting mainly the results of original investigations and terminating with the very important final report on "Industrial

Health and Efficiency". Similar work has been undertaken by the Committee's successor, the Industrial Fatigue Research Board, and four additional reports have already appeared under its own name.

In 1917 the United States Public Health Service became interested in the subject, and conducted similar investigations in this country. The first report of its work is now in press, while other papers are in preparation for early publication.

Canada also has taken up the work and has very recently organized a committee for carrying on similar studies. It is thus seen that this subject has already attracted a considerable amount of attention.

Among the topics which industrial physiology has so far considered are the following:

- Industrial fatigue
- Tests for fatigue
- The relation of fatigue and ill health to industrial efficiency.
- The industrial capacities of women.
- Hours of labor.
- Shifts, breaks, spells, pauses and holidays.
- Sunday labor.
- Night work.
- Lost time
- Food
- Sickness and ill health
- Injuries and accidents.
- Ventilation
- Heating and lighting
- Sanitary conditions
- The voluntary limitation of output
- Labor turnover
- Rhythm in industrial operations

All these subjects and many more come within the sphere of this new science of industrial physiology.

There are two things that are greatly needed at present in this matter:

1 Investigation and the encouragement of investigation. It seems to me that the opportunities of making known important knowledge by investigation along these lines are boundless. I wish that you might appreciate, as keenly as I, what seem to me the innumerable possibilities in the way of improving production that will result from this kind of work. Investigation here will well repay encouragement and assistance.

2. Education. We must educate investigators; we must educate industrial leaders; we must educate the foremen of factories; and we must educate the factory workers. I am interested to learn that the Canadian Committee proposes to organize an educational campaign, and proposes also to urge upon Canadian universities the importance of introducing courses in industrial topics.

Industrial employers are already taking an interest in this new work. It is very significant that recently two of the leading industrial companies in this country have appointed physiologists to positions on their staffs. The Goodrich Tire Company of Akron, Ohio, and the Scovill Manufacturing Company, of Waterbury, Conn., have each called one of the active and promising younger American physiologists to carry on work of this nature.

From what we have already learned in regard to the value of applying the principles of industrial physiology, it is, I think, obvious that if the work of the factory operative is to be performed



most effectively it must be organized on a physiological basis. This promises to be one of the most direct and most fruitful means of securing maximum production and maintaining at the same time working power. Industrial physiologists must therefore be trained. This should be planned for in any educational scheme that may be devised for the development of industrial hygiene.

Mr. C.-E.A. Winslow:

I feel that aside from the specialists, the actual line worker in this field is the physician who has had graduate training in industrial hygiene. There is no necessity for a special degree. Many of the institutions which are interested in public health give a certificate in public health for one year's graduate work and a Dr.P.H. for two years' work. At Yale we require for both these degrees a fundamental course in public health including sanitation, the control of communicable diseases, the organization of the modern public health campaign, and the like. We require also a brief course in sanitary engineering, a course in vital statistics, and a certain amount of public health bacteriology. That leaves ample time for specializing in industrial hygiene and industrial diseases. The man who is to do this work should, in my judgment, know enough sanitation to be able to judge of the adequacy of ventilation and lighting and to say what is wrong and to lay down the principles upon which good ventilation and lighting are based.

For the training of public health nurses we have a school for public health nurses, under the direction of the V.N.A. and they get brief courses in industrial hygiene and industrial diseases as part of their eight months training. We have only made a beginning. In an adequate department there ought to be these things provided for:

1. General teaching staff interested in the problem of industrial hygiene in all its aspects.
2. Occupational clinic
3. Strong supporting courses in social economics and business
4. Provision for industrial physiology
5. Definite provision for sanitation
6. Full provision for research
7. Close connection with industrial plants.

In an institution which has a school of public health organized to give graduate work in the general field, the additional things that are needed to do this work should not be very difficult to secure.

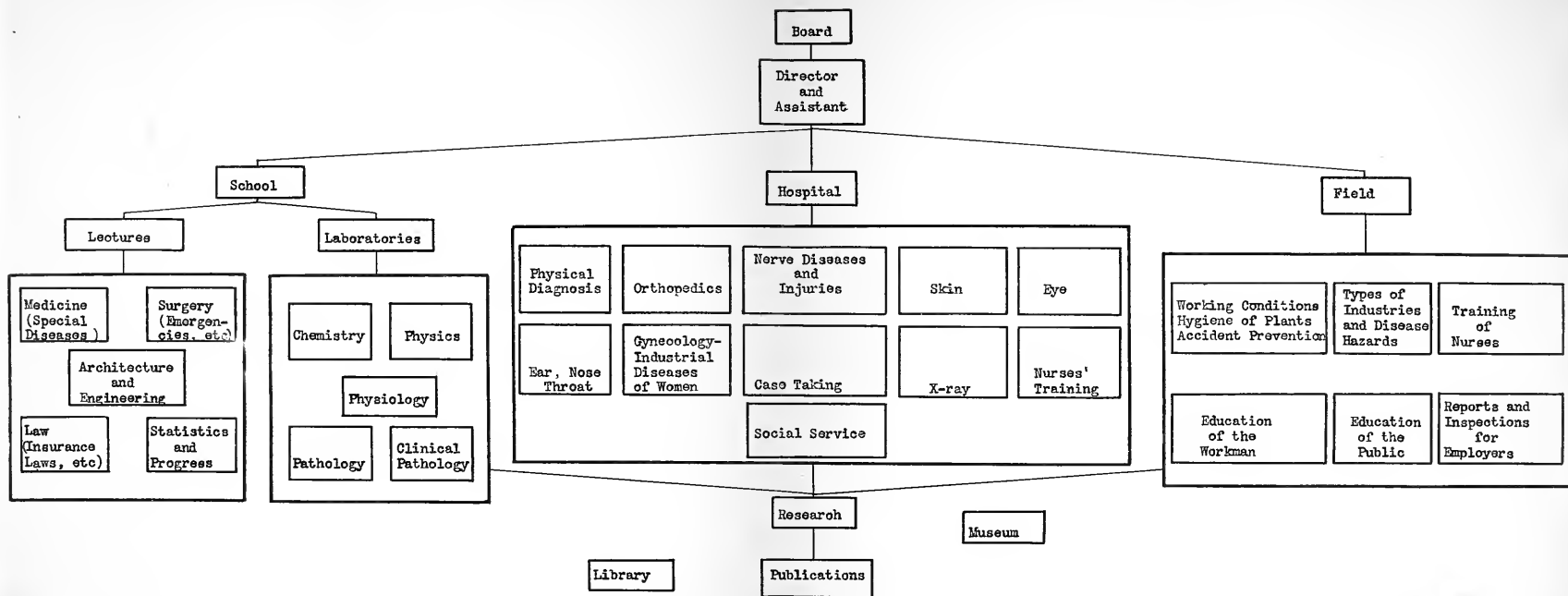
It seems to me we need in this field a number of centers. It has occurred to me that an excellent way to develop this sort of teaching throughout the country would be to take institutions in about ten centers, and say to the manufacturers of the locality, "Are you interested in this thing", if so, then offer \$5,000. or \$10,000 to be matched by the local group to start such a department. As soon as it shows itself valuable to local manufacturers it can count upon unlimited support.



Dr. W. Gilman Thompson:

I feel that Section C under No. 2 is out of place, and the question, "Should there be an institute of hygiene" should head the list on the questionnaire. There is going to be an institute of hygiene in this country sometime very soon. I should not be surprised if there are many established throughout the country. We are dealing with a tremendous economic problem. The corporations are being compelled by law to take better care of their workers. There is no one existing place in the country which could supply all the features of such an institution as has been suggested here. The whole question is this: Are we to have somewhere in this country a focus to study this entire field, where all the known facts are to be collected, studied and properly arranged, where instruction can be given to physicians and nurses, and through the institution, to the workmen and the general public. There is excellent opportunity for some foundation, individuals or group of corporations to see that an institution be established which will set up educational standards which other institutions feel they will have to approach. My conception of the organization of an institute of industrial hygiene is shown by this general plan: (Graph follows on page 32)

Should there be a separate institute of industrial hygiene? I take that to mean an institute not connected with a medical college. A general affiliation is very desirable for economic reasons, and for other reasons. Many of the professors can be drawn from a university but not from a medical college.



The Hospital with Out-Patient Clinic is for study of industrial accidents and diseases, their pathology and methods of physiotherapy.

GENERAL PLAN FOR AN
INDUSTRIAL HYGIENE INSTITUTE

W. Gilman Thompson

Some time ago I was asked to organize the medical service of one of the large corporations, and our experience has been absolutely against the part-time doctor. They do not serve the company as they should. I do not mean you should not have the part-time doctor, but you need men at the head of the service who give all their time. The head of the organization should unquestionably be a full-time man and well paid.

I should like to refer to the surgical aspect of the situation; we have thus far emphasized only medicine. Industrial surgery has become as important in industrial work as medicine. If there has been one thing which more than another has impressed me it is the very large number of industrial accidents which result in disability, which without very special technical care, is liable to become permanent. I merely wish to emphasize the importance of introducing into any plan to broaden the teaching of industrial medicine, the teaching of industrial surgery by the modern methods which have received such an impetus during the war.

I would like to emphasize once more the training of the industrial nurse. To my mind she is just as important in the well organized industrial plant as the physician.

Now let us discuss more in detail the advantages of a central focus for industrial hygiene education as compared with a series of smaller, scattered institutions.

1. The strongest argument for such a center is found in this conference itself at which the diversity of views and interests demon-

strate strikingly the need for a central clearing house, a place for establishing educational standards, as well as for the stimulation of research.

2. Many years would be required to develop the best type of personnel in a dozen different institutions, whereas the central institution would largely be occupied in training personnel to serve smaller institutions in various parts of the country. A large enough, first-class, trained personnel to supply an extensive group of small institutions is not yet existent.

3. A single parent institution could promptly be established and begin to functionate much sooner than a dozen smaller, scattered institutions could be developed.

4. It would enable the carrying out of expensive laboratory research, which could not, in many instances, be financed economically in smaller institutions.

5. It would emphasize in the minds of industrial corporations the fact that industrial medicine and surgery are distinctly specialized, and it would do more than anything else to stimulate these corporations to greater efficiency in the hygienic care of their employees.

6. It would enable the testing of experiments and methods, which, until their value is proven, might better and much more economically be conducted in one central institution.

7. It would enable the concentration of a collection of Industrial

Hygiene data of all kinds, and serve as a reference board for Industrial Hygiene problems which might arise in any part of the country, being entirely free from local jealousies or unfavorable influences.

8. Far from retarding the growth of smaller institutions, from its very "non-partisan" character, it forthwith would establish a goal of efficiency to which they might all seek to attain.

9. A large fund, divided among many small institutions instead of being applied to one greater center, would encounter many difficulties in existing organization. That is, one institution would wish to develop industrial hygiene under its public health school, another under its medical school, another in connection with a hospital, another without a hospital, etc., so that varying emphasis would always be given to the work. The time is soon coming when no first-class medical school can longer afford completely to ignore industrial hygiene in its curriculum, and that in itself is a further argument for a central organization to which all others may look for ideal standards to be approached as nearly as local conditions admit.

What are the arguments for a hospital and out-patient service in connection with a central industrial hygiene institute?

1. The hospital is needed to enable the collection of industrial diseases and accident cases for group study and intensive research.

2. It is needed to establish and demonstrate the modern, very specialized methods of treatment of these cases. Especially is this true of all the elaborate apparatus and methods of treatment for physio-

therapy, (hydro,electro,thermo-therapy, massage and physical exercises) demonstrated through war-time experiences as invaluable in shortening the period of disability after injuries.

3. The out-patient clinic is needed to enlarge the experience of the physician in the great variety of industrial diseases and injuries.

4. Such a clinic constitutes the human laboratory for research, and is just as important for the school as its chemical and physiological laboratories, designed for prosecution of material research.

5. One might as well attempt to treat an obstetric case in a general hospital ward among other patients as to deal in that manner with many of the industrial cases. Nurses, attendants and physicians, all alike, need concentrated training in the advanced methods of dealing with industrial cases.

6. The industrial accident case, like the wounded soldier, needs a special environment and atmosphere, as much for the psychic as the essential physical part of his treatment, attained in part through occupational-therapy as very technically adapted to his injuries. The industrial physician and nurse, to be of the highest value, should have opportunity for training in all these methods, in wards and out-patient classes segregated from the very different methods required for ordinary hospital cases, like those of pneumonia and appendicitis.

7. The ordinary general hospital service, so long adapted to other more or less routine methods, cannot include industrial, medical, or surgical cases without detriment to both services.

Dr. J.W. Schereschewsky:

This institute is clearly a function for the federal government, because it is something to be done for the nation as a whole. Some such institution as that should be financed and supported by the national government. The functions which Dr. Thompson has illustrated are essentially the duties of the government, which are advisory, investigative and co-operative. As a general government principle I feel that activities of this kind are primarily the functions of the government to carry on. It is a duty which it owes its citizens and should not be carried on by private enterprises. It should come under the federal service.

Dr. Otto P. Geier:

If the government had \$300,000 to spend on this sort of institution would it not be better to subsidize ten institutions rather than try to set up one station.

Dr. J. W. Schereschewsky:

Yes. As to the kind of institution, the sort of work which Dr. Thompson wishes to have carried out is primarily a work for a governmental agency.

Mr. George E. Vincent:

How could the plan be furthered as a government plan?

Dr. J. W. Schereschewsky:

Have a bill introduced into Congress to further the study of industrial hygiene and have manufacturers make it clear to Congress



that it is a needed activity; provide agencies for creating public sentiment. I think one of the most encouraging things we have now is the co-operation between the Public Health Service and the International Health Board in attacking the malaria problem.

Dr. Reynold A. Spaeth:

The Department of Physiology of the School of Hygiene and Public Health in Baltimore is developing in its work along the lines relating directly to the field of industrial hygiene. I voice the feeling of Dr. Welch and some of the other members of the faculty when I say that a Department of Industrial Hygiene could most efficiently be developed in connection with a school of public health. A separate institute is not particularly desirable or necessary. We feel that industrial hygiene involves the general principles of hygiene and public health as applied to industry.

Costly duplication of equipment would be necessitated by a separate institute, and furthermore there is no single research laboratory for industrial hygiene. In connection with a school of public health ample laboratory facilities would be provided for the investigation of special problems.

I am not in position to add anything to what has been said concerning the purely medical phases of industrial hygiene. I might suggest one thing. I believe it is important to bear in mind that a division of "clinical psychology" (Psychiatry) should be established, a division which would include the study of various industrial psychoses and neuroses, etc. The questions of illumination and ventilation are too much taken up by men who have had purely engineering training. The physiological aspects of both subjects are neglected. I should like to see a Department of Industrial Hygiene include the general subject of industrial psychology. Under this head we have a great deal of material

that ought to be given serious consideration. I have in mind the theory and practice of trade and intelligence tests. Other questions such as the psychological standardization of workers, the organization and function of employment management, the question of the theory of wage payments and incentives; the creative impulse, the theory and practice of the acquisition of skill and the training of apprentices would all legitimately fall under the caption of industrial psychology.

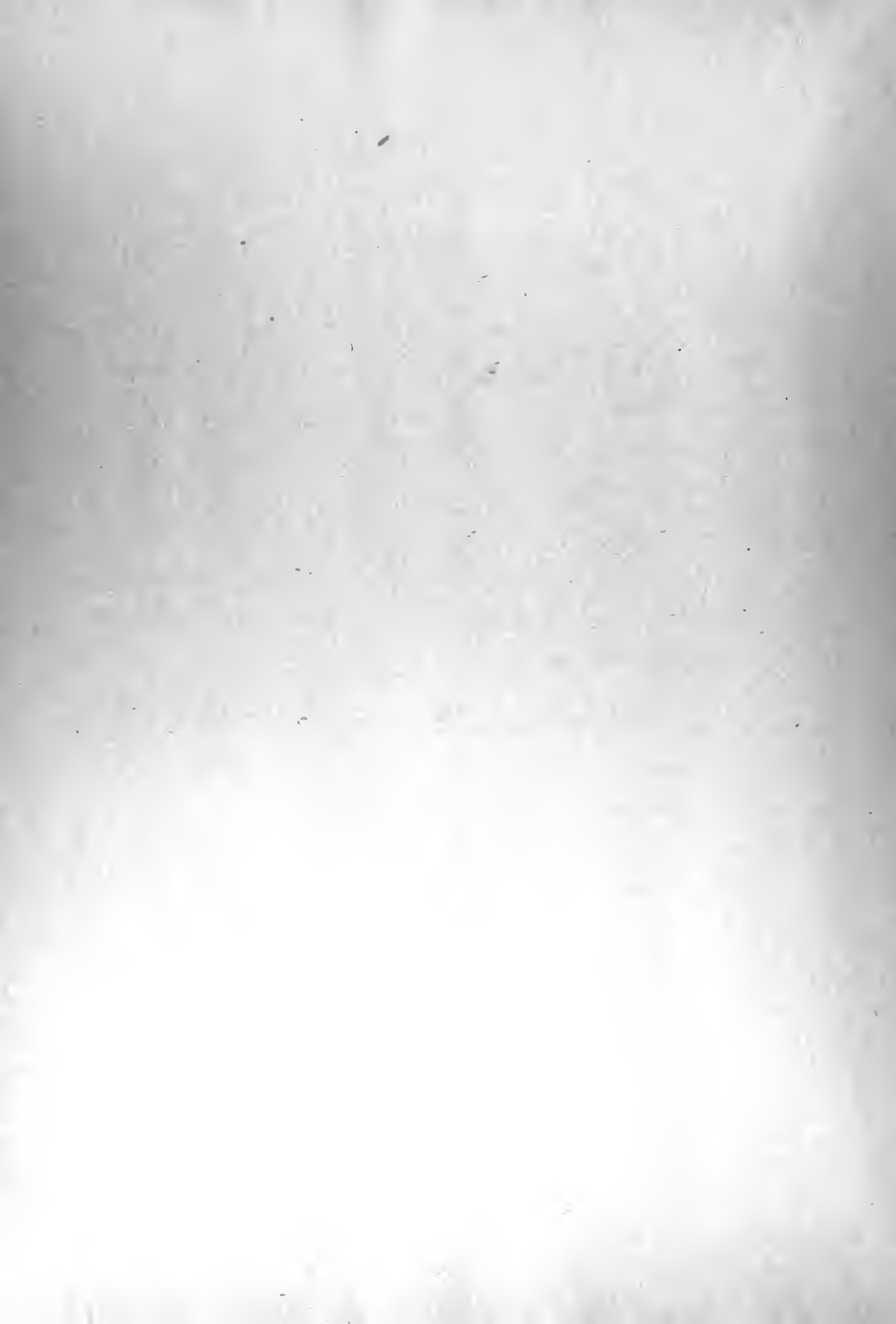
There are a number of subjects which may conveniently be included under the general caption of "welfare" or social service work which are at present too frequently in the hands of highly enthusiastic but untrained and sentimental amateurs. A department of industrial hygiene should provide for the adequate scientific training of these workers in so far as their work has a scientific basis. For convenience in organization such subjects as workmen's compensation insurance, factory and labor legislation, organized recreation, co-operative stores, rest and reading rooms, adequate and nutritious food dispensed in properly equipped cafeteria; housing and the standardization of factory construction could all be included under a division of industrial sociology.

Provision should be made for an industrial consulting service, which would correspond to No. 3 of Dr. Thompson's chart. I have in mind an organization which would permit the department to get into contact with industries. It seems to me it is important to get into contact both with organized management and with organized labor. We should get in touch with the chambers of commerce and manufacturers' associations in our own and other cities and have the men in the school represented

on the program of meetings which emphasize the production side. It would be highly desirable to publish readable accounts of the work and aims of the work in such magazines as Industrial Management, System, and Factory.

The general objective of such a department would be the instruction of industrial physicians; the instruction of a second group whom we might call industrial consultants; industrial nurses and social service workers. Research work would be carried out in the laboratories of the school and industrial field data could be worked up in the Department of Vital Statistics.

The remarks I have made are in no sense to be considered the official opinion of the faculty of the School of Hygiene but are largely my personal impressions of the organization and objectives of a Department of Industrial Hygiene in a School of Public Health.



Dr. Emory R. Hayhurst:

There are two or three things that have not been touched upon perhaps at all, and then some not sufficiently enough. One question is, What is the relation between industrial hygiene and public health work as regards the number of personnel? In Ohio we believe that 102 places filled, and about 50 more to be filled, would handle the health machinery of the state. If we attempted to do that for industry 150 would not be enough. This branch of public health work requires a much greater personnel than does that of public health work, - many industrial physicians, etc. in a single city. Therefore should it not be a field of its own? What is wanted is physicians specially trained; that has already been gone over.

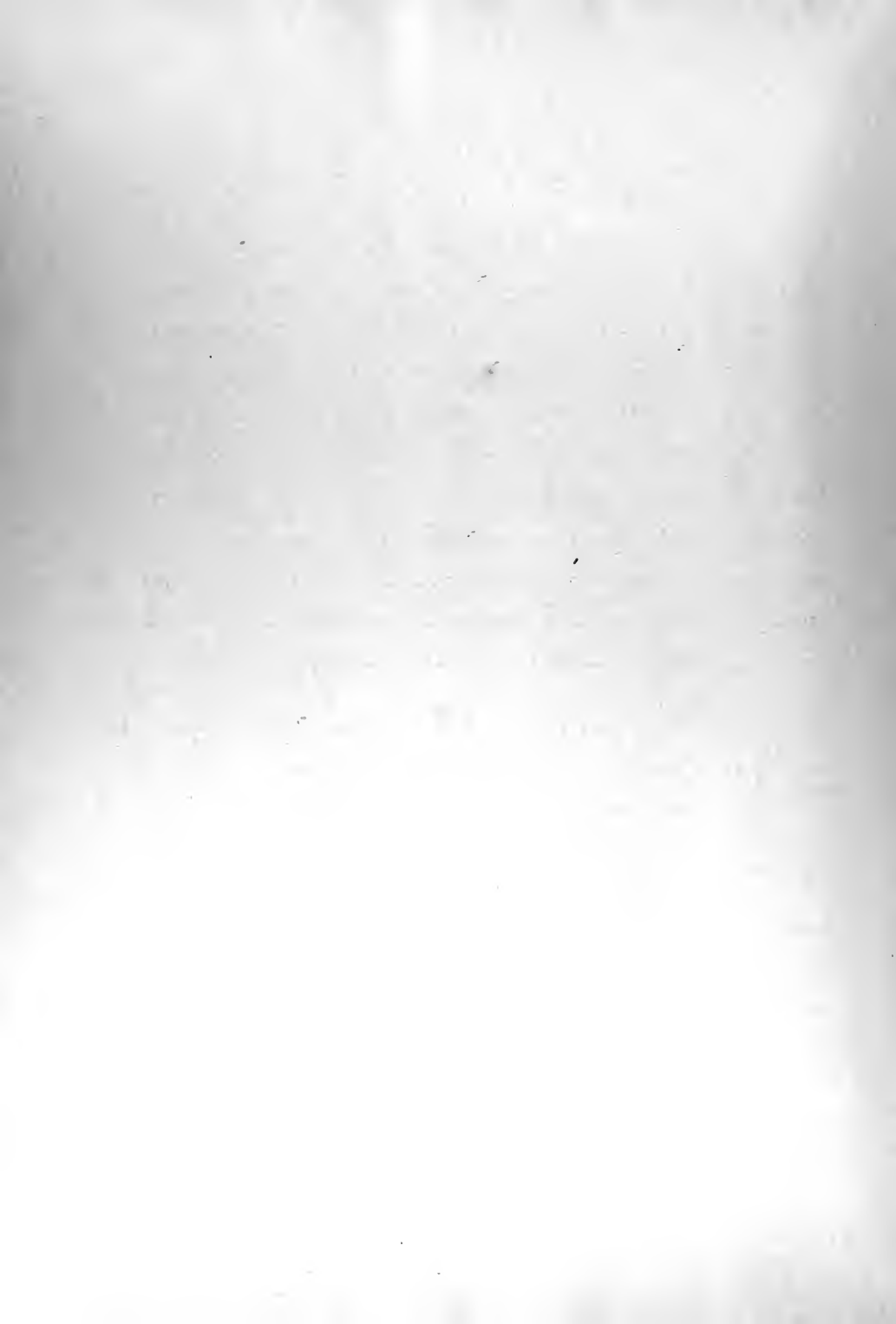
About one year's training of a recent graduate physician is about what is wanted to prepare him for a good industrial physician and surgeon, especially with the point of view he should have. He should get in that training that which would make him a good public health officer also. If he wishes, in the course of that training, to make his work a specialty in industrial hygiene, he can announce his thesis subject in December of the first semester. That is the plan we are following in Ohio in our course for preparing health officers. Our course is as follows:

First Semester

Hygiene - Personal
Public Health Administration and
Public Health Problems
Vital and Sanitary Statistics
Communicable Diseases
Public Health Engineering
Public Health Laboratory and
Inspection Methods

Second Semester

Preventive Medicine
Hygiene - Industrial
Social Service and Pub.Hlth.Nursing
Communicable Diseases
Public Health Engineering
Seminar and Thesis
Public Health Laboratory and
Inspection Methods



This course leads to a Master's degree in science.

Dr. Selby went through about 170 industrial plants in the middle and eastern states and he found this: In 42% the industrial medical service was under the department of production; in 21% it was under the department of compensation; in 18% it was answerable to the administrative head; in 15% it was answerable to the employment department. He came to the conclusion that the place for this was under the direct administrative head. The correct relation of the medical service is one thing which should be stabilized early. It will not have much influence in an industry if industrial medicine is made answerable to a minor department of the organization. The man who represents this work should have equal standing with the company's attorney and should attend the directors' meetings: he has a major responsibility in stabilizing labor relations.

Another feature that is lacking is the absence of "get-together" in the plants themselves, lack of co-operation between the plant-manager and his engineer, chemist, employment agent and medical director. Again, the scope of the medical director who must be trained in the principle of hygiene and preventive medicine, must be enlarged. An arrangement for teaching between the plant and the college would go a long way toward remedying that. We have instances in which our senior students are employed by plants overnight to do first-aid, and that gives them some insight as to what are the industrial needs of physicians, but they should get some undergraduate training in indus-

trial hygiene as well.

As to whether there should be one central institute of industrial medicine, or several scattered over the country, it would appear to me that one institute might satisfy a locality, but it would have to have branches to cover satisfactorily the whole country.

Dr. Cecil K. Drinker:

I have been extremely interested in the statements of Dr. Howe, because if one attempts to size up the character of the teaching which should be given in such an organization as we have formed in Boston, he is led to a conviction that one of the things most seriously needed is instruction in the art of developing and disseminating industrial health propaganda.

It has been my duty in connection with the industrial health work at Harvard to deal with the students and with certain of the investigations which have been undertaken. I can, therefore, give you some practical information which may be of interest.

In the first place, in regard to research: During the year and three-quarters in which the Harvard work has existed, a number of problems have been submitted to us. About one year ago Dr. Edsall and I undertook an investigation in regard to poisoning by manganese which was brought to us by a large company with headquarters in New York. Investigation of this situation demanded, in the first place, high-grade clinical and neurological work, and secondly, laboratory work which required the services of a mechanical engineer, a physical chemist, and a physiologist, together with several technicians.

During the war we had several assignments for investigation in connection with TNT poisoning. To answer these calls, careful clinical examination of a group of individuals was needed together with expert opinion upon blood pathology.

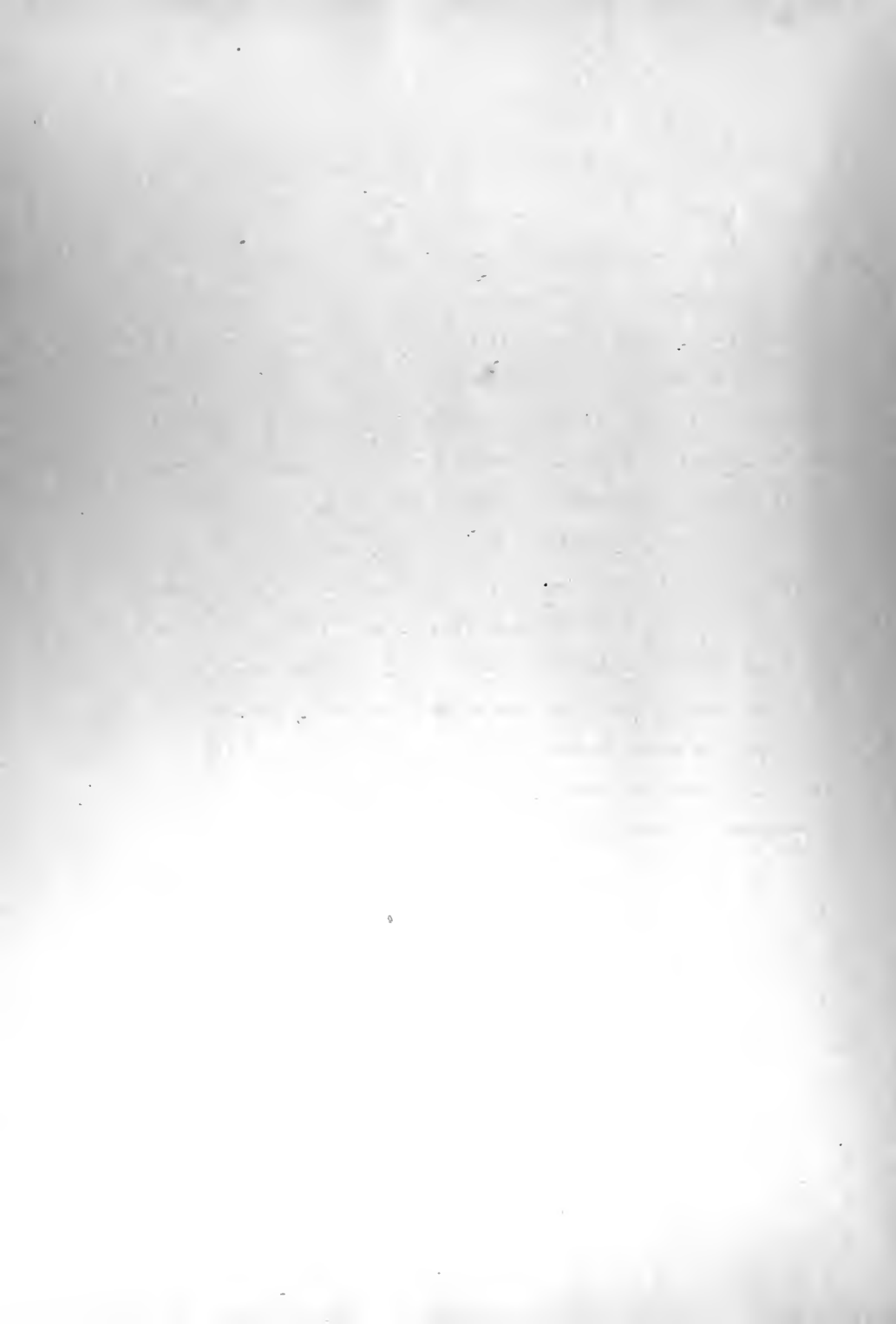
Recently we have been asked to give information to a large concern as to the possible harmful effects of an organic dust. This investigation requires the services of a clinical and X-ray man, a nose and throat man, a man trained in the problems of engineering and ventilation, and a man qualified to determine the bacterial content of the dust.

A request has just come to us to give advice and help in connection with a plant using tetrachlorethane. Here, the services of an extremely well-trained chemist are necessary.

One year ago we were approached by a group of men from the large department stores in Boston. These men came to us and said, "We employ doctors, nurses and welfare workers. Why don't you include us in your teaching program?" Finally we have agreed to do so, and have entered into a complete study of the whole subject of health in mercantile establishments. We are now the agents, in this investigation, of twenty or more stores, and shall spend the next five years investigating, reporting and recommending.

In addition to these requests which we have met, we have been asked to consult in a large spinning and weaving establishment in regard to fatigue, to establish in Tennessee a health department for a small town built about a large spinning industry. Our failure to answer these last calls has not been from any lack of interest in them, but from inability to carry the personnel necessary to spread through so many fields.

The instances which I have cited are ample to show that in-



dustrial health work cannot be carried on by a small organization. Extended facilities are required, and such sums as \$25,000 a year will not meet the needs of the situation. I believe it is necessary to use great judgment in the research calls which any such organization answers. One should be certain that he can perform real service before going into a factory. If this is not done, industry will cultivate a distrust of scientific medicine which will eventually do great harm.

Finally, in regard to the direct needs which we have experienced in Boston, I should say that they are confined to the organization of a thoroughly good chemical department and to the establishment of a department devoted to education in health matters. We have already, through Simmons College and the School of Social Service in Boston, made affiliations which should begin to cope with the questions of industrial nursing and welfare education.

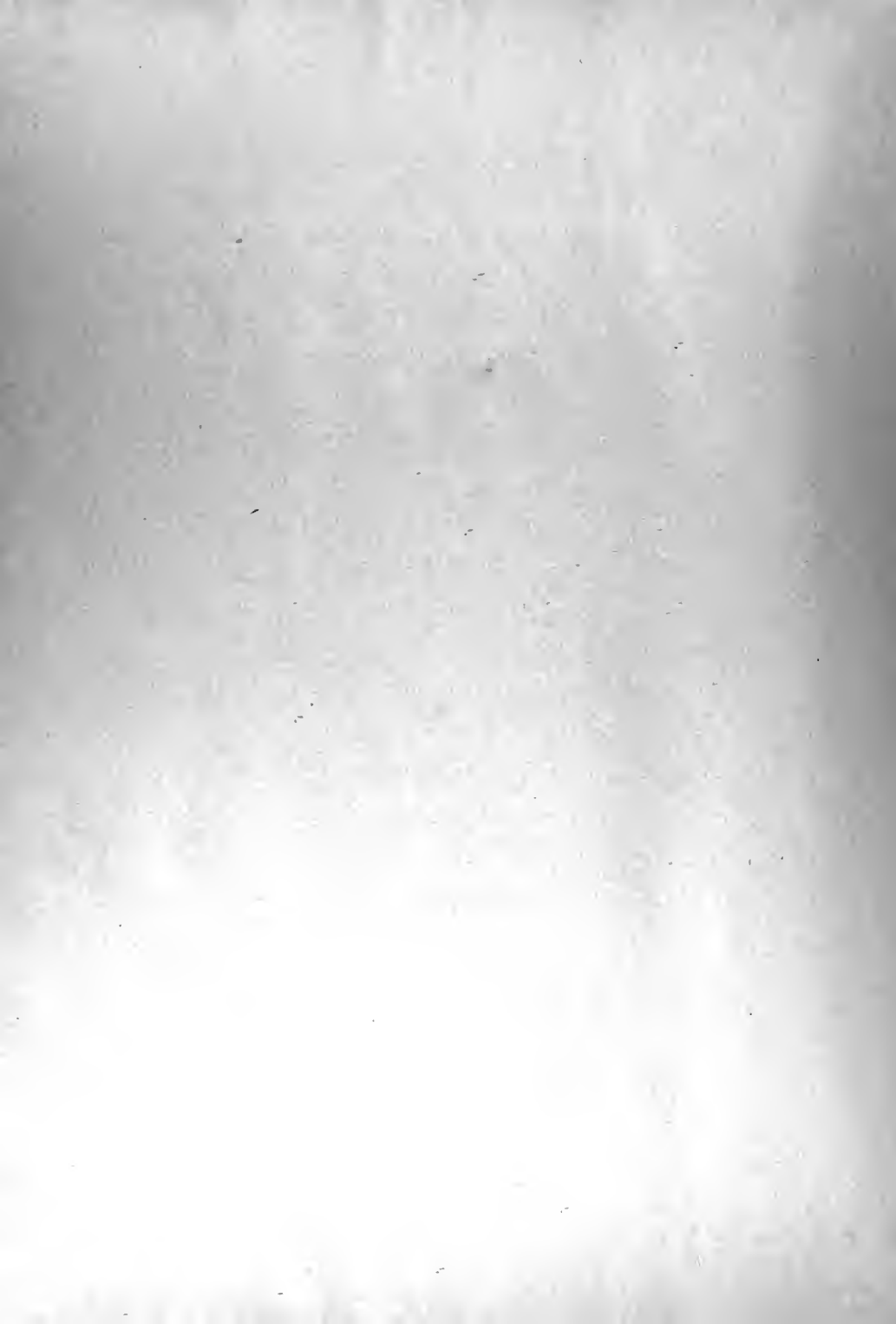
A few words relative to the type of students coming to us. If you rely upon post-graduate material for a School of Industrial Hygiene, you deal with a dismal group of students. During the past summer I have spent a large amount of time interviewing men who wish to enter Industrial Hygiene. A very large proportion of these were obviously failures in general practice. Something must be done to bring this field to the attention of the best type of undergraduates. The questions of research and supply of men for factory work will take care of themselves if we can get the best type of young men interested.

Mr. Charles Baskerville:

The universal publicity given to the use of "poison gas" in the World War undoubtedly directed greater attention in the United States to chemistry, with its mysterious possibilities, and the chemical industry, with its opportunities for production of wealth and possible control of trade therewith, than any other agency in modern time. Germany's specialization in the manufacture of coal tar derivatives coupled with extensive propaganda created an erroneous impression of the non-existence of a pre-war chemical industry in the United States. In this country no necessity exists to contradict the false impression, but it is a fact that the war brought about a remarkable stimulation to American chemical industry.

The pressure drove existent plants to intense systems for super-production. The exigency of the emergency brought about the hasty construction of many plants for the production of chemicals of great variety needed in the prosecution of the war. The speed factor did not admit providing all the preventives for the protection of the workers in some instances, and the transientness of contracts in others caused little concern for the welfare of labor. Chemicals have received and are to receive most of the blame. Unusual attention has thus become directed to industrial hygiene, which means "chemicals".

These and other factors associated with the enormous and permanent development of the chemical industry have caused thinking chemists to give the subject most serious consideration, oft expressing a strong hope that something worth while might be done in a large constructive way to better the conditions of the labor of the industry.



Something has been done by individual corporations, Public Health (National, State and Municipal) Boards, and Social Welfare and other organizations, but it has not been co-ordinated. Prior to the war the American Chemical Society, through initiation by the New York Section, organized a committee on Occupational Diseases in the Chemical Trades. The speaker has been Chairman of this Committee since its formation and has attended numerous meetings seeking to do something of value, primarily through developing the interest of the manufacturers, co-operation on obtaining uniform legislation in the different states and municipalities and bringing about a limited degree of publicity mainly among chemists. Something has been done in the way of research, in legislation, and in publicity.

In the first we have stimulated various health agencies to study conditions in the main and co-operated with representatives of Boards of Health and Bureaus of Labor in their investigations.

In the second we have co-operated in formulating some uniform laws for a number of states and cities, especially in the connection with wood (or methyl) alcohol.

In the third we have secured important contributions from specialists and caused them to have wide distribution in the trade.

The work has not been systematic or organized, for the very good reason that it has had no financial support. The Committee feels, while it may secure contributions for its work, that now is the time when the work should be undertaken according to a large program, which would call for more money than it could hope to secure. Furthermore the program would call for the co-operation of the chemist and not his direction. It calls for special training in the field of preventive



medicine, which involves social welfare.

The mephitic odor of the laboratory covers a maze of mystery in the lay mind and is held responsible for numerous maladies. The word "chemical" is sinister. Where chemical processes are in operation, especially when fumes or vapors, even though the latter be only steam, are seen to escape from the works there grows a feeling of suspicion, often with reason, and all kinds of sickness are attributed to these "poisonous substances." If the speaker may judge from numerous letters, even the members of the medical profession are not free from these sensations and confessions. And well they may be in many instances, for even though the action of many chemicals in varying degrees of concentration be known, the insidious effects of many more are absolutely closed books. They require most diligent study and painstaking research.

In this connection, there is an urgent need for publication of an immense amount of valuable research carried on by the Chemical Warfare Service of the Army and Navy, which now appears to have little chance to reach the light of day. The data on the physiological factors and changes involved in fatigue are of immense value. The alterations in gas masks for use in chemical industries in peace times constitute an important problem. The fact that workers (soldiers and civilians) in chlorine plants, or where small amounts of chlorine permeate the air, were practically immune to influenza during the first epidemic while their neighbors living and working under similar conditions, save the chlorine, were stricken right and left, opens a vista comparable to the hopeful days of the Pneumatic Institute, out of which came inhalation

anesthesia, gasacus disinfection, and foundational knowledge of bacterial changes.

There are good people in the chemical industries and there are farsighted corporations seeking means to improve conditions, but the evils of the conditions first serve to call attention to their existence. Efforts to palliate are evident in providing medical attention. It is good business to have healthy labor, but the motive is primarily humanitarian. Multiplication and adaptation of education for the workers call for teachers with qualifications peculiar to the needs.

The excellent, but limited programs of training given at a few institutions have been spread before us, but we have also heard it stated here that suitably trained men and women cannot be had in adequate numbers to meet the demand.

I speak without authority, but I assert with assurance that the chemical industry will welcome and co-operate with the separated efforts for the improvement of conditions. But it will go much further if those efforts be co-ordinated. So I venture to say that it would appear desirable to extend the present localized opportunities for instruction and tie them together in one main institute for research, advanced and special instruction, and for co-ordination.

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